N.A.C.A. BULLETIN

In Two Sections

Section One

A QUARTER CENTURY OF COST ACCOUNTING PROGRESS
by J. HUGH JACKSON 1201

DOES YOUR INCENTIVE WAGE PAYMENT PLAN MEASURE UP?
by E. A. CYROL 1210

DISPOSAL OF PEACETIME SURPLUSES
by ROBERT A. MORGAN 1230

VOL. XXVIII, NO. 19 JUNE 1, 1947

EDITORIAL DEPARTMENT NOTE

It is a well-known fact that we are apt to overlook the woods for the trees. So many of us are so busy with the details of everyday affairs that we are oblivious to the general trends that are taking place. We are sharply reminded of this in Dean Jackson's article pointing out the direction that cost accounting has taken during the last twenty-five years.

J. HUGH JACKSON'S association with N. A. C. A. began when he attended the first meeting of the Boston Chapter in 1921. He has been active in the Association since that time and was National President in 1938-1939. He has engaged in public accounting work, holding C.P.A. certificates from Wisconsin, Massachusetts, and California. He has taught at the Harvard Business School, University of Oregon, University of Minnesota, and Stanford University. He is the author of several books and numerous articles; and is a trustee of several banks, colleges, and other institutions. Since 1931 he has been Dean and Professor of Accounting of the Graduate School of Business, Stanford University.

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Our second article deals with the important subject of wage incentives and the allied problem of labor relations. This is a basic article in which the author discusses the problem from the point of view of the requirements of an incentive plan, of the man who installs it, and of the management.

E. A. CYROL's business experience includes employment as a tool maker's helper intermittently while studying for his degree at the University of Michigan. He was associated with the Murray Corp. of America during 1939-41, where his duties concerned cost control, time study, and standards development. During 1941-42 he was with the Packard Motor Car Co., Aircraft Div., manufacturing the Rolls-Royce-Merlin engine for American and English aircraft. Since 1942 Mr. Cyrol has been with McKinsey, Kearney & Co. of Chicago.

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A great deal is heard these days about the problem of disposal of wartime surpluses. We are reminded in the last article of this issue that peace also produces surpluses. The problem of waste and surplus disposal is an ever-present source of worry. The author presents a scientific attack on this problem.

ROBERT A. MORGAN, the author of the article, is a graduate of the University of Illinois. Upon leaving college he became associated with the Pure Oil Co. Subsequent to that employment and until December 1944 he held the position, at various war plants, of Field Auditor with the Ordnance Department, U. S. Army. Since that time he has been associated with Caterpillar Military Engine Co. and Caterpillar Tractor Co. in various accounting and auditing capacities.

This *Bulletin* is published semimonthly by the National Association of Cost Accountants, 385 Madison Ave., New York 17, N. Y. Subscription price, $10.00 per year. Entered at the Post Office, New York, N. Y., as second-class matter August 28, 1925, under the Act of March 3, 1879.

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NATIONAL ASSOCIATION OF
COST ACCOUNTANTS
JUNE 1, 1947

A QUARTER CENTURY OF COST ACCOUNTING PROGRESS

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IT SEEMS most appropriate that occasionally, in connection with our study of cost accounting principles and techniques, we should turn our eyes backward and review the developments of cost accounting over past years. Someone has said that history is like an arrow—it is shot out of the past, passes the present, and points the way on its flight into the future. The next quarter century portends much progress and many important developments in the industrial life of the nation, and cost accounting will assuredly make a very constructive contribution to industry during that period.

For practical purposes I have taken the year 1920 as the starting point for our survey of a quarter century of growth and progress in cost accounting. If we are to appreciate fully the progress cost accounting has made since 1920, we must also have some concept of the happenings prior to that date. Hence it is proper to review briefly the more significant developments in the cost accounting field prior to 1920.

First, the keeping of cost records in accordance with the principles of double-entry bookkeeping had been definitely accepted and well developed. Moreover, these records were fairly effective in supplying management with historical data regarding past production costs. This had been true even during the early years of the twentieth century. However, there seems to have been little attempt to estimate or predetermine costs during these early years of the existence of cost finding.

Cost Literature

Second, a very considerable amount of good cost material had been published. Much of it might be considered obsolete by today's industry, but these earlier writers sensed many of the problems facing the cost accountant of today, even though they may not have developed the techniques necessary to put their ideas into effect. It is fair to say, however, that cost accounting did not step forth in the late twenties or the thirties full-grown and com-

pletely developed, but rather represents an evolutionary process which has gained greatly in momentum as the years passed.

According to the Research Department of N. A. C. A. the earliest known major American writing on cost accounting was "The Cost of Manufactures," by Henry Metcalf. The second edition of this volume was published in New York in 1890. The Research Department had no record concerning a first edition, and I have found none. However, this second edition was a complete book on cost accounting by both the process and the job order methods.

Books had appeared even earlier in England, and in 1893 the fourth edition of Garke and Fells "Factory Costs" even suggested that cost accounting might be used in controlling the costs, thus:

> "Before any order to manufacture is given it is advisable, as tending to produce greater economy in cost of production, that the person best acquainted with its processes and details should estimate the probable cost to be incurred in wages and materials, in the production of the articles in question. This estimate should be a minimum rather than a maximum one, and the storekeeper, having been furnished with particulars of it should not, without special authority, issue more material for the order than is estimated."[1]

Other early writings include: Henry Roland, "Effective Systems of Finding and Keeping Shop Costs,"[2] in which the author states that "factory cost systems which completely ignored many of the fixed charges were not uncommon at that time"; H. L. Arnold, "Cost Finding Methods for Moderate Sized Shops,"[3] in which he mentions a large boiler manufacturer who "charged production orders with direct costs only, all indirect costs being omitted from factory costs and being sent to the general bookkeeper and there charged to expense accounts monthly"; A. Hamilton Church, "The Proper Distribution of Establishment Charges";[4] John Whitmore, "Factory Accounting as Applied to Machine Shops";[5] and so on.

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[1] Garke and Fells, "Factory Accounts," 4th Ed., pp. 51-52. London. Crosby Lockwood & Son, 1893.
[2] *Engineering Magazine*, November, 1898, p. 207.
[3] *Engineering Magazine*, December, 1902, pp. 385-395.
[4] *Engineering Magazine*, Vol. 22 (1901-02), p. 375ff.
[5] *Journal of Accountancy*, Vol. 2 (1906), pp. 248-258, 345-357, 430-441; Vol. 3 (1906-1907), pp. 20-31, 106-122, 211-218.

Predetermined Costs

Third, there had developed a definite realization that historical, or "post-mortem," costs were not sufficient. Predetermined costs had become the vogue, either (1) on an "estimated" basis, or (2) an attempt at "scheduled" costs, which were definitely the forerunner of present-day standard costs.

As an example of the "estimated" basis of predetermining costs, the standard cost-finding system of the United Typothetae of America, prepared in 1909 and revised in 1919, is among the best. It is not based solely on past experience with average costs and average rates of production, but rather upon such past experience, *plus* current knowledge or present-day estimates of future conditions (price of raw materials, wage levels, etc.) and production demands (future customer orders, etc.). This system of cost finding, for which the man-hour or machine-hour rates were adjusted monthly, served effectively not only as a basis for pricing products, but also as a check on the efficiency of men and machines ("ems" of type set per man hour or linotype hour, "impressions" per press hour, etc.). Even today this system is considered an efficient plan of cost-finding and cost control in an industry made up of thousands of small plants scattered in every town and hamlet of the country.

Early Standards

The "scheduled" costs of these earlier days were an approach to crude standard costs. John Whitmore, as early as 1908, in "Shoe Factory Cost Accounts,"[6] approached the modern concept of standard cost finding methods. From this writing, one has the conviction that such methods were in use at an even earlier date. In the handling of leather, for example, Whitmore advocated the valuation of the sorted leather at a "proper" price for each grade, as follows:

Sorted leather (priced at "proper" cost, by grades)	xxxx	
Variation debit (or credit)	xxx	
Leather purchases (accounts payable) at actual cost		xxxx
Sorting labor (actual cost)		xxx
General expense (actual)		xxx

[6] *The Journal of Accountancy*, Vol. 6 (1908), pp. 12-25.

Whitmore recognizes that these variances may arise from either or both of (a) prices differing from the "proper" or standard cost, and (b) differences in the quality of the leather.

Whitmore also charged direct labor to work in process at "proper" or standard rates. In the case of overhead expense he states that he had not made an actual application of the same methods, but felt certain that it could be accomplished[7]

Uniform Accounting

Fourth, and the final pre-1920 characteristic that I shall mention, there had come about the general development and adoption of uniform systems of cost finding and accounting. Some of these did not amount to a great deal, while others represented excellent work, prepared by the best accounting brains of the respective industries. Just as examples of the latter, one may mention the systems prepared by the American Petroleum Institute, the Electrical Manufacturers Association, National Retail Drygoods Association (Controllers' Congress), United Typothetae of America, and the West Coast Lumberman's Association. According to the N. A. C. A. Research Department there were 69 such uniform systems in existence by 1920.[8]

In my opinion this movement towards the creation and adoption of uniform systems of cost finding and accounting revealed several very significant developments within industry itself.

1. It represented a very definite awakening, or cost consciousness on the part of industry generally, and a very specific and constructive attempt on the part of the leaders in the various industries to educate all units within the industry as to value and use of modern, scientific methods of cost finding.

[7] This article, describing the above system, according to Dr. W. B. McFarland, formerly Professor of Cost Accounting at McGill University, and now a member of N. A. C. A.'s Research Staff, is the first of its kind to appear in accounting literature. By 1920 many writings had appeared on the subject, and many uses were being made of such costs: for example, Frederic L. Small's "Shoe Cost Accounting," (Boston, L. & S. Printing Co., 1914) which describes a system very similar to present-day standard cost systems as described by Harold S. Wonson, "The Application and Uses of Standard Costs in the Shoe Industry," in the N. A. C. A. *Bulletin* of November 1, 1936, pp. 255-283; Clinton H. Scovell, "Cost Accounting and Burden Application" (New York, D. Appleton & Co., 1916), pp. 180-183; and G. Charter Harrison, "Cost Accounting to Aid Production" (Industrial Management, Vol. 56. 1918), pp. 391-98.

[8] In the 1923 N. A. C. A. Yearbook, p. 297, Dr. S. C. McLeod states that there "were 121 trade associations of which the N. A. C. A. office had recorded the adoption of a uniform system of cost accounts."

2. On the basis of the above, it tended to stabilize the respective industries by furnishing definite costs, and eliminating unscientific and unintelligent pricing and price policies. Thus it tended to do away with the kind of "cut-throat" competition which could only mean demoralization within the industry.
3. The introduction of scientific methods of cost accounting also meant bringing into thousands of industrial units a more efficient organization, better purchasing and production methods, improved controls, and a stepped-up tempo generally within individual businesses and all industry. In my opinion, these accomplishments would have been deferred by several decades without the coming of modern, scientific cost-finding methods, developed through these uniform systems in thousands of business units. It is a movement for which industry itself must largely have the credit, and which has been far-reaching in its present results.

The Past Twenty-five Years

The preceding background of happenings prior to 1920 now gives us a basis for considering what has been the further growth in cost accounting during the past twenty-five years. All of us are largely familiar with what has happened within our own industries, and perhaps in many other industries in our midst. I shall not, accordingly, try to cover details of changes or developments within the past quarter century, but rather to portray the broad sweeps which characterize cost accounting growth during our own generation. These I have set down as being five in number, and they are presented not necessarily in the order of their importance, but as a matter of convenience only.

Refinements and Improvements

First, refinements and improvements in the principles, procedures, and techniques of cost accounting. This includes all the improvements and changes in the methods of developing and handling standard costs, in computing and distributing overhead or burden expense, in the handling of materials—purchasing, receiving, storing, issuing, in the pricing of inventories (including the so-called "fifo" and "lifo" methods), in recording cost variations in the double-entry system of accounts, in the preparation of cost reports and summaries, etc. It also includes any refinements resulting from the general installation and use of computing and

recording machines of all kinds, which have become recognized as an almost universal need in cost accounting work.

Such a development might sometime be worthy of a major presentation in itself, but at the moment it represents merely one of the broad sweeps of the brush on the canvas of cost accounting progress and history. I leave it, therefore, for some later paper to explore and develop.

Universal Application

Second, the extension during the past twenty-five years of the application of costs and of cost-finding methods to practically all businesses and to all major functions within the business. In the case of business in general, this is perhaps the result of a combination of circumstances, such as (1) further expansion of uniform cost-finding methods by industry itself (2) the requirements of the N.R.A. during the "thirties" that business could not sell below cost, and therefore must know its costs, and (3) the requirements of World War II regulations that costs be accurately determined in connection with war contracts. All of these meant that thousands of concerns learned for the first time something of their costs and the value of cost accounting methods; the great majority of such concerns found much of real value in these procedures and the results emanating from them, and it is generally conceded that such cost-finding methods will become a permanent part of many of these business organizations. It is definitely a new development when government steps in and, for the protection of business itself and also the taxpayer, requires that reasonably accurate cost methods must be used. It represented a phase of the regimentation program which will probably result in good to the economy as a whole.

The extension of cost-finding principles and methods to the distribution function is definitely a development of the last quarter century. Prior to 1920 articles and books on cost accounting related almost solely to "factory costs" or "production costs." Distribution cost accounting, on the other hand, is primarily a development of the last half of the twenties and the first part of the thirties. At the 1924 N. A. C. A. National Convention one or two papers dealt with distribution costs, but by the International Cost Conference of 1930 an entire day's program was given to this highly important subject. Business has come to recognize definitely that profits are not in the till until the product has been

both made and sold, and that efficient production can be largely or completely offset by inefficient and expensive distribution. This extension of cost-finding principles and techniques to distribution is a development that is here to stay.

Costs for Pricing

Third, while the use of costs for cost determination, management guidance, and pricing within individual businesses has become well established, it also has been definitely established that the use of costs within an industry to enhance prices and restrain trade is entirely outside the pale of the law. The last authoritative pronouncement on the subject was the United States Supreme Court decision of June, 1925, in the case of the Maple Flooring Manufacturing Association. In this decision Mr. Justice Stone carefully made the distinction between collusion to enhance prices and to bring about restraint of trade, and the collection and dissemination of statistics without any such collusion, in the following words:

> "We decide only that trade associations or combinations of persons or corporations which openly and fairly gather and disseminate information as to the cost of their products, the volume of production, the actual price which the product has brought in past transactions, stocks of merchandise on hand, approximate cost of transportation from the principal points of shipment to the points of consumption, as did these defendants and who, as they did, meet and discuss such information and statistics without however reaching or attempting to reach any agreement or any concerted action with respect to prices or production or restraining competition, do not thereby engage in unlawful restraint of commerce."

The above merely emphasizes again that there are individuals and business units who will take procedures or methods developed for their benefit and profit and will utilize them to the detriment of others. When such persons or businesses reveal a complete lack of social consciousness or moral responsibility, it is both necessary and proper that the strong arm of the law should be felt.

As cost accountants we can rejoice that the point has been settled by the high court of our land, and that the cost account-

ing principles and techniques, which we have worked so hard to develop as an integral part of business and industry, should not have been cast into the discard, but rather should have been saved from improper and malicious use. I think this a most fortunate development in the last twenty-five years of cost accounting growth.

Cost Control

Fourth, from the standpoint of management, the development and extension of costs for purposes of cost control, and in some cases of cost reduction, has been the outstanding item of progress or growth in cost accounting during the last quarter century. Generally, this growth in the use of cost accounting for control purposes is intricately related to the progress and developments that have been made in standard costing. The scientific setting of standards for all the elements of production and distribution costs, and the use of these standards not only in arriving at relative costs but also in determining degrees of efficiency within every part of the business unit, have been among the marvels of modern organization and management.

Much will continue to be written, and many more detailed improvements will still be made over the years, but the basic cost and management tool, which was dreamed of and occasionally used in its crude form during the first two decades of this century, has come to fruition during the quarter century since 1920. To the industrial engineer and the scientific management movement, and to the seasoned accountant of the John Whitmore type, business and industry, and the cost accountant in particular, owe a debt of gratitude which only increased efficiency and service on our part can ever repay.

Flexible Budget

Finally, I wish to mention the development of the budget, and particularly of the so-called "flexible budget" for use with standard costs, as another major cost accounting development or growth of the past twenty-five years. This is a somewhat more recent development even than standard costs—in all of the publications listed by N. A. C. A. from April 1920 to January 1942, only one reference appears prior to 1930 (in the 1928 Year Book) and only six references prior to 1935.

But cost accountants and managements have come to realize that it is not enough to use even a so-called standard overhead, and then disregard in their cost work the various fluctuations occurring in actual overhead such as arise from variations in shop activities, abnormal maintenance charges, and so on. This use of the flexible budget is a matter of which cost accountants will hear much during the next quarter century, and through its use in their own companies will undoubtedly become more familiar with it than they are at present with the standard cost and its application to industry.

Conclusion

In conclusion, I believe it may be said that the growth of cost accounting over the past twenty-five years has been a highly satisfactory and truly remarkable one. That growth has included refinements and improvements in the science and art of cost finding, in the extension of its uses to practically all businesses and to all major functions within business, to the defining of the rights and restrictions under which it may operate, and it has brought to fruition the standard cost, and, to a less degree, its counterpart, the flexible budget. During this period cost accounting also has won the approval of management; the only limitations placed upon its further growth during the next quarter century will be measured by the vision and ability of the cost accountant, together with the demands of an enlightened, forward-looking management.

COMING ARTICLES

In the *N. A. C. A. Bulletin*, June 15, 1947

An Approach to Budgetary Control
by C. H. Eckelkamp

Verification of Traffic and Transportation Functions
by David J. Menges

A Personalized Tax Manual for Your Corporation
by Herman C. Weber

DOES YOUR INCENTIVE WAGE PAYMENT PLAN MEASURE UP?

by E. A. CYROL,
McKinsey, Kearney & Co.,
Chicago, Ill.

THESE seem to be days for the incentive wage idea to be re-examined. Its proponents see it as the only remaining road to high productivity and real prosperity, since the spur of the desire for promotion or the fear of discharge is practically gone. Its opponents see it as the source of many or most of the grievances that labor has against management. Of course, the proponents are usually speaking from a background of successful application of wage incentives or from a conviction that incentives can be correctly designed, installed, and administered, while the opponents are usually speaking from an experience with unsuccessful application of wage incentives. For it seems that wage incentives have always led a Dr. Jekyll and Mr. Hyde existence, and many know this method of wage payment through meeting it only at one or the other extreme.

In the past, too many plant managements applied an incentive pay system without reading the instructions for its application. Instructions are usually consulted in the self-righteous attitude of "What have we done wrong now?" only after the thing has been tried and found wanting. Naturally, the answer is always "We've done nothing wrong. (How could *we?*) The thing just doesn't work!" The wage incentive idea finds itself in an unhappy position at this time because many incentive plans that were ill conceived by misguided industrial managers and so-called efficiency experts and rate setters have become cancerous; because plans of a stopgap nature have been installed in recent years; and because stopgap features have been injected into otherwise sound existing plans. Probably eighty per cent of the plans now in operation are in this category.

Many such plans are kept in operation through sheer stubbornness on the part of management that too often does not take the trouble to examine the plan. Many similar plans have been scrapped because the labor force would not work under them. Only here and there have managements and the unions, upon finding their incentive plans unsound, cooperated in revamping their plans or in completely abandoning the old plans and installing new ones that have been developed from their experience. Such occur-

rences, few though they may be, are the only bright spots in an otherwise dark picture.

Since there are good and bad wage incentive plans, it should be possible to establish a set of requirements for a successful application in the installation of a new plan, or for use as a measure of comparison against an existing plan.

To be successful, a wage incentive installation must live up to requirements that can be segregated into the following three divisions:

1. A good plan must be used.
2. A qualified man must install and maintain the plan.
3. Management must be informed on the potentials and limitations of wage incentives.

Shortcomings in any one division cannot be compensated for in the other two. The requirements discussed below are not presented as newly discovered truths, because they are not that, but as well-known facts that after all the trials and errors still form the frame that must be filled if a wage incentive installation is to be successful.

The Plan

It is simple enough to indicate that a sound plan is required, but what makes an incentive plan sound? If we would learn from plans that have succeeded and plans that have failed, the principles discussed before seem to underlie the successful plan.

Production Standard

A good production standard is the first requirement, but a production standard is good only when it is used under the conditions for which it was established. An incentive system can operate effectively only if a standard is correctly established through time study and then carefully maintained, to reflect changes in:

1. Job conditions where allowances made for unavoidable delays are either too large or too small.[1]
2. Dimensional requirements, surface finishes, number of spots or length of weld, and so forth.

[1] Allowances for unavoidable delays comprise a story in themselves. The author discussed the subject in an article "How to Determine Standard Allowances for Unavoidable Delays" in the October, 1945 issue of *Mill and Factory*.

3. The condition of the raw material that comes to the work center for processing.
4. Machine speeds and feeds, and tool arrangements in the setups.

A good production standard is the first requirement, but incentive plans have actually been installed without benefit of any method of work measurement. Past performance has been used to establish production quotas; foremen have set, and are still setting, standards by guess or by bargaining with the operator. The managements and the unions involved both blame those wicked incentive plans for difficulties which arise from production quotas poorly set.

Providing the Incentive

The incentive worker must be able to earn enough above his guaranteed base rate to be tempted to try for higher working efficiencies. However, additional earnings must come only as a result of additional effort. Potential bonus earnings from 15 per cent to 35 per cent may be required, depending on the type of work being performed. For example, a 15 per cent potential may be enough to entice a bench worker to his or her full efficiency, whereas a 25 per cent potential may be necessary to keep an operator feeding a draw press or punch press running open hour after hour.

The following example will demonstrate how muddled is the thinking on this score of bonus earning potential. An incentive plan that was showing signs of weakness specified that a 10 per cent allowance be made on all machine-paced operations, while 20 per cent allowance was to be made on purely manual operations. Furthermore, according to this plan, this 10 per cent would be figured from a midpoint of a rate range. In other words, a draw press operator working at the top of a $1 to $1.20 rate range would be able to make about $1.21 per hour if he realized the 10 per cent bonus on the $1.10 midpoint of the rate range. When the practicability of a plan that allowed a machine operator to earn all of one cent per hour bonus above his hourly guarantee if he worked at incentive pace was questioned, the answer was "Well, we 'blow up' the handling time so that the operator can earn more than that!" This is the kind of practice that lacks common sense and brings suspicion on the incentive method of wage payment. It is more direct and honest to say that an operator, to run a

machine at its full capacity, must be able to earn 20 per cent to 25 per cent bonus, make the allowance, and stay with it.

Rewarding the Worker

The plan should reward the worker in direct ratio to the increased output resulting from increased effort. If there is one per cent increase in production, there should be one per cent increase in earnings; and these earnings should reflect as closely as possible the increased effort of the individual worker who gets them. If a group arrangement must be used, the group should be as small as possible and should be composed of workers whose work bands them into a natural group.

This requirement has been ignored to the detriment of incentives. First we got the gain sharing plans. These were the now-you-get-it-now-you-don't plans which succeeded in convincing the workers that they were stupid, indeed, thus to be taken in by management. There are some plans that are called gain sharing or that give the impression of being gain sharing but in fact are plans which allow the worker to earn about 40 per cent over standard and then take about 20 per cent away from him. The worker is pleased with such an arrangement about as much as he is pleased with the income tax he has to pay. One explanation for gain sharing plans is that they were needed in the days of the efficiency experts to interest some employers in incentives by misleading them into thinking that they were getting something for nothing through curves and graphs which only the efficiency experts knew how to apply!

Hourly Base Rates

If an incentive plan is to operate effectively, hourly base rates for incentive workers should be equal to hourly base rates for like jobs. These base rates should be determined according to a systematic evaluation of the attributes that go to make up the different jobs.

This is another requirement of sound incentive that is often mishandled to the point where the incentive plan is damaged. The difficulty that comes from basing incentive earnings on midpoints of rate ranges has been mentioned. Under this arrangement, with a rate range of $1 to $1.20, the midpoint, or $1.10, is used for calculation of incentive earnings. Thus a beginner gets a ten cent raise when he is on incentive and the old-timer who is at the top of the rate range gets a ten cent cut. Usually,

under these conditions, the time study man establishes rates so that the $1.20 an hour man can earn about 20 per cent more. In this way the time study man evades a grievance on every rate he establishes, but the foundations of the incentive system are being dangerously undermined.

Simplicity

The plan must be easy to understand and allow simple time-keeping and payroll procedures. It should be possible for each worker to calculate his own earnings. We know that workers are pretty capable calculators. Their little black books often contain records more complete than the payroll, and a simple plan can be readily understood and suspicions of underhandedness allayed thereby.

The plan must be easily understood *by the worker,* not the controller, not the president, not the works manager, not even the union international representative. It is the worker that must understand it as it applies to his paycheck. Management often feels that a plant-wide incentive plan is the easiest to understand. It may be so in the case of management but not in the case of the worker.

Under the plant-wide plan management says to the worker, in effect, if you increase your production you will get more money in your pay envelope. Imagine the uninitiated worker in for his first experience with such a plan. He has been producing, let us say, five assemblies a day. Now, he really hustles and produces fifteen a day for a full pay period. He dreams of receiving three times his usual pay—or at least double the usual pay. When payday comes, he receives a bonus equal to 10 per cent, 15 per cent, or even 25 per cent of his pay. He feels cheated and incentives are no good as far as he is concerned. But, management will argue, the plant was only 10 per cent, 15 per cent, or 25 per cent more productive; the worker just does not understand!

Prompt Payment

The premium earnings must be paid to the worker who earned them with as little lag and holdover as possible. The more immediate the payment of the bonus earned, the greater the spurring quality of the incentive plan.

We all want quick returns. This quick return factor is probably one of the important attractions that makes gambling so uni-

versally popular. Still, industrial managers like to believe that a turkey at Thanksgiving or a check at Christmas time—that is, if the management is making money—is an incentive to high productivity! The returns must be quick and definitely tied into the amount of production.

Adjustments

Any necessary adjustments to production rates, permanent or temporary, must be made by the time study man. Changes in production standards to compensate for changes in job conditions, materials, tools, methods, or equipment may be necessary, but they must be controlled. Many incentive plans, well installed initially, have degenerated because changes in production standards were permitted to be made by the timekeeper, or the foreman, or even the foreman's clerk.

Failure to measure up to this requirement brings degeneration of the incentive plan along a well-worn path. A change in standard is required in the shop for one reason or another. The foreman might have been careless in re-establishing the conditions under which the standard was determined; the material received for the job may not be according to specification; the needed machine may not have been available due to some failure in scheduling. But suppose a time study man is not available because management has not provided enough of them for these maintenance purposes or because the time study men have not decreased the man hours required for their own work by utilizing standard data. Hence a change in standard is made by the foreman or the timekeeper or someone else who is more interested in removing an immediate problem than in maintaining the incentive system in proper working order. The next time the job is run the irregularity which was reason for change in standard no longer exists, but if the change made the standard "juicy" it remains in effect. Soon that change is used as the basis for a similar change in another standard. And so it goes until the standards are completely out of kilter, and another installation of an incentive system is in the process of providing the opponents of incentives with arguments against the whole idea of incentive wage.

Rate Cutting

A plain statement specifying when production quotas may be changed must be in existence and interpreted by management that

recognizes the human inertia to change. Because of rate-cutting practices of the past, management must now be doubly sure that all practices are above any suspicion on this point.

Although a clearly written statement is a requirement, its application must come from a management that understands the worker's attitude with respect to this question. Workingmen seem to be put on guard whenever something new is introduced among them. They assume that it bodes them evil, no matter what it is —a labor-saving device, a new process, a change of method, or even a change in supervision. Their attitude is especially puzzling to management when it finds resistance in the shop to innovations which management expects the worker to recognize as beneficial to himself. When the change calls for a decrease in the time standard, or an increase in the production per hour required for the affected operation, the resistance is immediate and united. The management that is aware of this inertia can approach the problem at least with forethought. It may find certain considerations helpful in this respect.

Irresponsible time study men may introduce fictitious methods changes so that they may reduce a standard which they first established incorrectly. The time study man of shallow character usually justifies this action in his own mind on the basis that the worker cheated by working too slowly when the original time study was taken, and so it is a case of tit for tat. In truth, the time study man is attempting to camouflage an error that would be certain to come to the attention of management; and thus keep himself in the good graces of his management regardless of the damage perpetrated to the incentive system involved.

The workingman is more inclined to accept a change in his working methods if he is made to feel in on the planning of the change than is the case if he feels himself to be on the receiving end only. The vice president in charge of manufacturing knows instinctively that he can sell the president on an idea if he manoeuvers him into feeling that the president was the source of the idea. The worker in the factory and the president of the organization are the same in some respects; it is up to the vice president in charge of manufacturing to realize that.

If the worker has reason to feel that he is protected against unreasonable cuts in rate, he may be receptive to the change. Management can provide such feeling of security to some degree by training some members of the work force or of the union or-

ganization in the techniques of time study so that they may review the reduction and be convinced that it is justified.

The basic wage should be based on job evaluation that takes into account the normal physical effort required in the performance of the job. Whenever a standard is changed to require higher production, therefore, management should investigate the physical requirements of the job under the new standard. The worker may be justified in objecting that the rate change forces him to do more work for the same amount of money. That should not be true.

Written Wage Policy

A wage incentive plan, to be effective, must be completely described so that all interested parties may inform themselves about its workings; therefore, a written wage policy is required. Such a policy should be written before the incentive plan is installed. Like the rules of a game, it should be written before the game starts and before any decisions have to be rendered. If it is written after the installation, it will consist of compromises reached after the grievances (that are sure to come) have been decided. A successful policy must contain the following:

1. A description of the incentive plan to be used.
2. A description of the time study methods to be used.
3. A description of the leveling to be used to bring the observed time to average performance.
4. A description of allowances to be made for personal needs, unavoidable delays, and fatigue, and an example of the calculations involved.
5. An explanation of standard data to be used and its origin.
6. An explanation of the method of calculating earnings.
7. A presentation of rules governing transfers of employees to new jobs with different base rates.
8. A detailed explanation of the timekeeping procedures to be utilized.

A written wage policy is important but difficult to accomplish. Too often management has not taken the time to think its policy out in sufficient detail to allow putting it on paper. Some managers feel less tied down to any specific commitment if they are able to refrain from submitting a written policy. Of course, this is false security; but this conviction exists and prevents wage in-

centives from being as successful as they might be. An incentive plan is in reality a contract between an employee and an employer that a certain amount of work will be done for a certain amount of money. The employer would not expect a vendor to agree to supply raw steel stock or finished assemblies without a written order that spelled out the agreement in full. Yet this same employer expects that of his employee.

Maintenance of Plan

Finally, the plan must be constantly policed and maintained in good working order. Failure at this point has destroyed more incentive plans than any other one thing. It is important that management realize that an incentive plan cannot be maintained by the efforts of the time study group alone but that all the levels of management, the foremen, the superintendents, the factory managers, the personnel directors, the tool designers, the product engineers, and the production control managers must understand and cooperate in maintaining the incentive wage in good working order.

That managements so often fail to fulfill the last requirement is not surprising. Managements are prone to install mechanical equipment in their plants and expect it to perform efficiently forever. The large number of plants that attempted to hold dimensional tolerances of plus or minus a half-thousandth with thirty, forty, and fifty year old machines at the beginning of the war attests to that. The failure to maintain a well-equipped shop is an all too common shortcoming of management. This damages both its ability to produce at lowest attainable costs and the incentive wage method of pay.

These are requirements that must be fulfilled to obtain a good, practical plan. These are not requirements for a theoretically perfect plan. To the degree that incentive plans now in existence do not measure up to these requirements, to that degree the incentive wage payment idea has not been given an opportunity to prove its worth. How well does your incentive wage payment plan measure up?

The Man

The incentive wage payment plan must be installed by a man who is qualified by experience and training. He must have the kind of background that will allow him to formulate a sound plan according to the principles discussed above to suit the par-

ticular needs of the plant in which he operates. He must also be able to appraise the other functions that will affect the operation of the incentive plan although they may not be directly tied in with it. To fulfill the first requirement the man must have had a background of experience in the installation of one or more plans that have worked out successfully. To fulfill the second requirement he must have sufficient appreciation of all managerial functions to be able to appraise them in the light of the needs of an incentive and advise management on any changes that might be required before an incentive plan installation can be attempted. His job is twofold. He must present a workable plan and then bring about the necessary understanding and cooperation among the different levels of management and the labor group on the question of wage incentive pay.

Study of Runs and Lot Sizes

The one responsible for the installation of an incentive plan must know the requirements for the successful application of such a plan and be able to put them into practice. In his testing to see whether the proper foundations are present within an organization for an incentive plan, he must start with the sales forecast or the sales demands as they come to the manufacturing division from the sales group to study the length of runs and lot sizes. For, if the lots released for manufacture are small and the runs in the shop are short, or if the work loads are sporadic, it may be inadvisable to attempt wage incentives. However, if his background is of sufficient breadth to enable him to indicate to the sales department how customer orders can be accumulated or sales forecasts prepared through more thorough study of market requirements, longer runs can be made possible and the plant might be able to enjoy the advantages of incentives.

Specifications and Other Records

To be instrumental in the installation of a sound incentive, the man also must be able to examine and judge the quality of the bills of materials and blueprints as they are issued by the product engineering group. In the determination of production standards through time study and standard data, the feeds and speeds for machine shop operations must be specified; the number of blanks per strip must be known in punch press operations; and the length of weld or the number of spots in welding operations must be specified. The sources of this information are the material speci-

fications in the bills of materials and the part blueprints. This is one of the ways that the standard conditions which are so necessary for proper maintenance of production quotas can be circumscribed.

Records as far removed from the area of incentives as inventory records have an important bearing on the successful application of incentive wages because, if they are incorrect and material shortages occur as a result, factory operations are disturbed because the runs are shorter than initially planned or substandard material is substituted that may need temporary standards. If, for example, short length steel strip stock is substituted for the specified longer length, the production standard established for the punch press operation in which the stock was to be used will not hold. The worker then fails to meet standard or earn bonus and dissatisfaction with the incentive plan begins, or the time study department must hurriedly establish a new temporary production standard to cover the new set of conditions, thereby creating several standards for the same job and increasing the administrative costs of the incentive plan. Obviously, the correctness or incorrectness of inventory records is reflected in the operation of the incentive wage payment plan.

Operation Sequence Sheet

The functioning of a wage incentive plan depends also to a very large degree upon the completeness and explicitness of the shop routing or operation sequence sheet that is available. Although in some organizations these routings originate in the time study department that is also responsible for the administration of the incentive plan, it is not unusual that they may come from departments outside of time study, such as the process engineering group or the master mechanic's organization or the planning department. If the man responsible for the effective operation of the incentive plan is not also responsible for the shop routings, he must be able to judge whether they specify precisely what operations are to be performed, what machines are to be used, what tools are required, the classification of labor needed, and enough description of the operation to insure that all machining, assembling, welding, or painting is performed as required.

Tool Control

The soundness of the tool control system utilized must be adjudged in the plant where an incentive wage plan is in the offing.

The tools specified on the routings must be available for the operator's use when they are needed because, as in the substitution of substandard materials, the substitution of tools other than those specified introduces changes in the shop operations which in turn require changes in production quotas for the operations involved. Furthermore, not only the physical control through tool cribs is imperative, control of changes in tool design must also be in existence because such changes may affect the rate of production. Machine shop operations may be affected by the grinding methods used in resharpening tools; therefore, to maintain optimum, conditions under which operations are performed in the shop, centralized tool grinding as a section of the tool crib may be indicated.

Purchasing and Inspection

If materials received from vendors are not to specified dimensional tolerance, finish, or composition, the production standards determined when the material was to specification will not apply. Thus the production rates become unsatisfactory and the worker has a grievance, or the time study department must establish new temporary standards which again bring increased administrative costs and increased opportunity for trouble in the incentive wage area. Therefore, it must be ascertained whether or not the inspection procedures used are sufficient and whether the purchasing department is sufficiently acquainted with the proper specifications to order correct materials. Of course, on the score of quality control within the plant, the man responsible for the operation of the incentive plan must also be sure that in-process and finished goods inspection is thorough enough to discourage working pace that is too high for the maintenance of good quality.

Timekeeping and Basic Wages

Production standards are only the goals which the time study group establishes for the workers in the plant. Timekeeping is the function that reports how well the workers have performed as compared to these established goals and what they should be paid as a result of their performance. Therefore, sound timekeeping procedures are required. Such a procedure must be introduced where none exists or changes recommended where they are needed to insure that the wage incentive program will not be damaged from this source.

The man who will guide the incentive plan installation must ascertain that the plant has a correctly established basic wage structure. If a sound structure is not available, he may find it advisable to first introduce job evaluation which will support the basic wage structure through consideration of physical requirement, responsibility, skill, and hazards involved in the performance of each job in the plant.

Job Instructions

For operations with a reasonably high degree of complexity such as precision machine shop operations, job instruction cards are needed in addition to the shop routings mentioned before. These job cards carry descriptions of the elements of the operations and their sequence; the speeds and feeds to be used for each tool in the setup and its position are also given thereon. In this way, the job setter can re-establish the same work center as was in existence when the production standard was determined through time study. Such other information as the type of coolant used, the additional time allowed for unavoidable delays and the relative locations of raw and finished stock can also be given. All this information tends to prevent worker misunderstanding and dissatisfaction and thus maintain continued acceptance of the incentive plan. Incidentally, it also forces management to study the operation completely and specify carefully what work it is that the operator is required to do in the time prescribed by the standard.

Qualified Supervision

The system of paying wages for the amount of work accomplished rather than for the time the worker is in attendance in the plant can bring everything its proponents say that it can—decreases in labor costs, increases in the size of the check the worker takes home, and increases in the capacity of a plant without additional investment for equipment and building facilities—but the incentive plan must be suitable in view of the operations performed in the plant and it must be acceptable to the organization, both managerial and labor. The incentive system of wage payment can be compared to an automatic feed attachment. It will reduce costs for an operation if it is correctly designed and installed, properly maintained, and attached to a good machine.

Too often, for the good of a wage incentive, top management has failed to place the wage incentive program in the hands of a

qualified individual. But just as often, the man who is given the opportunity of installing an incentive plan fails to do the thorough job necessary because he is so oversold on the potential of the incentive wage that he is sure any shortcomings within the organization will be overcome by his plan. In consequence, he has sold it to top management on the premise that it is a panacea. Of course, in time, incentives sold on this basis always suffer a setback; and now we are asking ourselves, "What's wrong with wage incentives?"

The Management

Because of gross mishandling by uninformed management in the past and because there is little evidence that management is seriously attempting to study the requirements of wage incentives, the future of the wage incentive idea does not appear to be very bright. We have seen instances of labor strikes being called and sustained until management agreed to drop an incentive plan. We have seen labor unions limit the production and earnings to a stipulated percentage over the guaranteed base rate. We have seen incentive plans kept in effect by stubborn management against pressure for its discontinuance or correction from the labor group with a great deal of friction resulting. We have seen incentive plans in effect that are poor examples of the incentive method of wage payment, in which the worker turns in to the payroll department any production he deems he should and keeps "banks" for bad days. We have heard unions declare themselves against incentives even in the war years when production was so urgently needed. We have seen managements manipulate wage incentive plans in a shortsighted and uninformed manner to the detriment of the incentive plans. We have heard management blame incentives for the poor labor relations it had in its plants.

If management continues to misuse wage incentives it will lose the use of a most effective means of getting full production for its labor dollar and, indeed, lose its control of the productivity of labor. The resulting poor productivity would bring a lower standard of living, and this in turn might bring unrest severe enough to shake the foundations of business and its management. To avert this, management must act with more intelligence and purpose than it has ever acted in the past. This action would seem to have to follow the steps outlined below.

Efficiency in Management

Management must make itself more efficient than it generally is. Actually, labor tends to be about as efficient as its management. Therefore, any attempt to make labor improve its efficiency without similar improvement on the part of management is headed towards failure. Labor that sees waste in materials, poor maintenance of equipment and, yes, even poor utilization of manpower objects to continued prodding from management for greater and greater efficiency. Management must remember that labor cost is only a part of total cost, that a decrease in material costs through better design is its own responsibility, that effective use of materials and supplies must be planned by management, and that overhead, 150 to 300 per cent of labor cost, is a bountiful source of savings through proper budgeting and general efficiency in management functions.

Understanding Wage Incentives

Second, management must evince more interest in methods of paying wages and in labor's attitude in general. It must learn more about wage incentives than it has learned in the past before using them. What wage incentives can and cannot accomplish in a plant and what they need to function successfully must be understood. It must study wage incentives with fully as much concentration as it gives to the marketing of the goods manufactured. For wage incentives to be successful in a plant, management must know enough about this method of wage payment to formulate a philosophy that must underlie the policy for the administration of the incentive plan. It must employ personnel capable of administering the incentive plan according to its concepts. Management has in the past too often selected and still selects a shipping clerk who without proper training is set to establishing production rates for incentive pay because "he's good at figures" and, incidentally, because he would accept a relatively low salary. That same management later laments that time study techniques are not capable of establishing sound production rates! Informed management knows that production standards must be determined by persons with proper training and experience.

Informing the Worker

Management must decide that informed employees are better employees than uninformed ones. On the one hand, the workers

should be informed about their company. Management must now —as it failed in the past—let the worker in on its plans and its problems that affect the workers' welfare. On several occasions when workers were asked for their opinion as to what was wrong with management, they complained that they felt left out of the picture as to what their employer was up to. It would seem that management would feel called upon to fill this apparent need to talk to the worker on any topic in which he is interested by making use of plant publications, bulletin board announcements, advertisements and stories in local newspapers, and so forth. On the other hand, management must inform the employee about the workings of our economy through the medium that the labor unions have shown is effective, such as posters, moving pictures, cartoons, and illustrated pamphlets that carry a message but do not require laborious reading. It is conceivable, for example, for managements of several industrial concerns to band together to finance a series of such illustrated pamphlets to be prepared by several of the leading universities of the nation and distributed in the plants operated by these managements to inform their workers of the economic rules and regulations of our type of economy. There are some indications that once the worker is made aware of the facts involved, he will make sound decisions.

Enlarging Scope of Incentives

Management must strive to extend the incentive method of wage payment to a greater number of workers in the plant than is usually the case, and once placed on incentive the worker should continue to work on incentive with little or no day work. Here, management is justified in calling upon the industrial engineer, who is forever attempting to show other people how they might improve the methods they utilize, to better his own methods of work measurement. There are at present far too many groups of workers that are considered outside the sphere of incentive pay. However, although we are justified in asking the industrial engineer to improve his methods of work measurement, it is true that generally he does not utilize to the full extent the methods that are now available to him. As an example, there are far too few standard data in use. Yet they can be used where time study alone is absolutely impracticable for the establishment of production standards. Operations such as setup, packing and shipping, loading and unloading of boxcars and trucks, and construction or heavy

assembly can be placed on standard through the use of standard data where individual studies would be too expensive to be used.

Use of Standard Data

There are other uses for standard data, and it is a sad commentary on the progress the industrial engineer is making in his own field that so little of it is in evidence. The reasons usually given against their use are pure hokum; such reasons as that standard data are too costly, or that they require too much time for compilation, or that they are not accepted by the worker group because to them establishing production standards from standard data tables is tantamount to pulling standards out of the air, are not reasons at all, but excuses for the industrial engineer's inability to create the required standard data. Yet, standard data should not be a new or strange tool to the industrial engineer or, as a matter of fact, to the estimator, the process engineer, the tool designer, and even the union grievance committee. Still, the handling of all the functions of rate setting, estimating, processing, tool designing, and handling of grievances involving production quotas, could be made infinitely more effective if the industrial engineer would improve his knowledge of the science of work measurement and would distribute freely within his organization the fruits of that knowledge.

Cooperation from Labor

Management must secure greater cooperation from the labor group than it now enjoys. And nowhere is this cooperation as important as in the field of hourly rates and production quotas; this is the source of 80 per cent of all labor grievances regardless of whether incentives are involved or not. This needed cooperation cannot be obtained through any magic formula, but its basic ingredients are very well known.

1. Management must be thoroughly honest. This honesty must be evident at every turn.
2. Management must be informed so that it selects a sound plan and sells it to labor on a sound basis with all its details fully and honestly explored.
3. Management must be thorough. Once a plan is sold it should be installed quickly and efficiently. The worker, like management, likes to see efficient activity.

4. Management must be patient with labor. It must explain, teach, discuss, and explain some more. A good guess is that the first seeds of the present labor trends were sown when management first lost its patience with labor matters.

Training the Bargaining Committee

One specific method of getting the needed cooperation in the wage and hour field is training the bargaining committee in job evaluation and time study techniques. Of course, before management decides to invite company into its house it must be certain that its house is in good order and presentable to the scrutiny of critical company. However, once such a committee is trained, one very useful clear channel for communication has been established between management and labor. Whenever management hesitates to do this, the chances are that it does not sincerely feel that its house is in good enough order to receive critical company.

In an actual case[2], the management of a company asked the union organization to appoint candidates from their organization for training in time study. This company now has two stewards trained in time study and capable of taking an active and helpful part in resolving problems arising from a challenge of a production standard by an employee in the shop. A significant feature of this arrangement is the participation of the time study stewards in investigating the validity of a challenge of a production standard but no participation in the original establishment of production quotas, although they do have access to all the time study files and standard data. Incidentally, they understand the purpose and are convinced of the soundness of standard data; they have checked it on many occasions and know that standard data are insurance for the worker group that management will not demand greater and greater production as the pace in the plant increases under the spur of sound incentive. This is the old rate-cutting fear that is still with the workers. But, on the other hand, they also understand that production required by standard data will not be lowered because an individual operator cannot meet the quota. This is insurance for management against pressure from the labor group to change standards purely on the grounds that the standard cannot be met by an individual in the shop.

[2] The full case history appeared in the March issue of *Mill and Factory* magazine. The company involved is the Dumore Co. in Racine, Wis.

Improving Tools and Equipment

Management must provide labor with better tools and equipment than were generally provided in the past. It would seem that management is prone to ignore the direct connection that exists between the condition of equipment and building facilities and the attitude of labor toward management—that is, labor relations and tools. Labor may be somewhat balky at accepting the short-run adjustments that may be necessary as a result of labor-saving machinery, but there is not a worker alive who would not be happier operating a modern turret lathe that will hold dimensions effortlessly than operating one that is old, worn out, poorly maintained, and incapable of turning out good work. Add to the annoyance of frequent adjustments to his machine the requirement that the operator meet a production standard during the work period and you have a disgruntled employee who is ready to blame incentives for all his troubles because they seem to rush him and make the adjustments necessary even greater in number. Let the manager who disbelieves this line of argument ask himself how happy he is with a poorly operating automobile that is no longer to be depended upon, or with shabbily made equipment for his hobby work shop or his sports needs, or even the pen or mechanical pencil that will not respond when he is in a hurry to jot down that important note. Why, then, should it not be true that the workers in the industrial plant are equally human and equally happy to have responsive and carefree equipment?

Conclusion

The incentive system of wage payment is under fire again because in the large number of installations made during the war years many were poorly conceived, hurriedly put into effect, and administered by personnel unskilled in the techniques required. But incentives have been unpopular in the past. Incentives appear to have had popular and unpopular periods as a matter of action and reaction. The bungling administration of this method of wage payment has made it unpopular and diminished the number of existing plans, but incentives have been brought back again because the workers seem instinctively to desire compensation that reflects their individually varying efforts and skills. Thus it would seem that incentives would have ready and lasting acceptability if management only took the care required to use them properly. A plan that is not satisfactory, one that does not measure up, can be re-

vamped or removed to make place for one that will be acceptable. However, the new one will naturally be entering the plant under a handicap, and management must be doubly certain that it is sound, that a qualified man will direct its installation and administration, and that management itself has learned from the previous failure.

Experience indicates over and over again that incentives bring the lowest cost, the highest take-home pay, and the highest volume of production for a given plant capacity, all else being equal. Incentives would be abandoned completely, therefore, only with the admission on the part of management that it must henceforth be satisfied with something less than the highest attainable productivity.

It may appear that another vital segment of requirements has been ignored in this discussion in that the labor attitude specifically, as such, has not been fully treated. However, if the plan for the incentive wage payment, and the man for its administration, and the management attitude measure up to the requirements set forth here, the proper labor attitude will be formulated in the course of their fulfillment, and the wage incentive will be acceptable and workable. Of course, if there has been a long period of poor labor relations, the period of correction may also have to be correspondingly long.

Real Value of Cost Analysis

We must recognize that the real value of cost procedure, tied in with the general records, is the proper accounting for the gap between planned product cost and actual operating cost so that the future planning can be more accurate and excessive operating costs eliminated. Historical costs of individual products which account for total cost of manufacturing are of only limited value in future planning and may not be acceptable for ending inventory valuation without adjustment to exclude costs which result from curtailed activity, avoidable expense due to inefficiencies, market declines in cost levels, and costs which are not recoverable in the current product selling prices.

H. T. McAnly, "Should Unusual Costs Be Allocated to Period Rather Than Product?" in The Journal of Accountancy, *May 1947.*

DISPOSAL OF PEACETIME SURPLUSES

by ROBERT A. MORGAN, Internal Auditor,
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BECAUSE the conclusion of the war left the country with mountainous quantities of a wide variety of items not readily usable in civilian pursuits, both industry and government were forced to devise methods of adapting or disposing of war surpluses. Elaborate schemes of cataloguing, priority systems, auction sales, and widespread advertising characterize the disposals by the War Assets Administration. Private disposal of war surpluses has been highlighted by the rapid appearance of clearing house companies which list their clients' surpluses and circularize these lists to large mailing rolls.

Although war accentuates surplus disposition problems because war material is so often different from peacetime goods, surpluses occur daily in most businesses. As office methods are improved stocks of printed forms become surplus, and changes in products result in parts becoming obsolete. Some concerns throw the old stock of forms in the waste paper basket; others convert them into scratch pads; sometimes it is feasible to overprint; but usually some value can be realized even if only the junk price.

When a business has a few changes it is not necessary to have a formal plan to dispose of its surpluses. When a change occurs it is relatively simple to decide what disposition shall be made of the obsolete stock. However, when a business expands to the point that it manufactures many products with the resultant volume of interchangeable parts, and when development of the products is going on all the time, a plan to dispose of surplus systematically and economically is required to insure management that no usable materials are wasted and to safeguard against improper appropriation of obsolete materials by providing internal controls.

Caterpillar Tractor Company's line of diesel powered tractors, diesel engines, and related construction equipment which is manufactured in various sizes and models presents a good example of a business where surplus disposal techniques can be employed effectively.

How Surpluses Occur

In general, surpluses may be classified as "nonproduction" and "production". Nonproduction surpluses are the superseded printed forms, the obsolete incandescent light bulbs left over following installation of fluorescent lighting, and all the other indirect materials, supplies and tools no longer required because of changes in methods or physical plant. Production surpluses are those direct materials left over after a change of models or after engineering changes creating new specifications have gone into effect. Because the handling of production surpluses is connected with production and material control, that phase of surplus disposal will be discussed in this article. Parallels may be seen in the handling of indirect or nonproduction materials.

Surpluses Arising from Product Changes

In our company all departments concerned are advised of changes in designs or specifications by means of a drawing release or change notice (Exhibit 1) prepared by the engineering department. This change notice specifies the name of the part affected, the model (or models) of tractor, engine, road grader, or other product on which the part is used, descriptive details, date the change is to be effective, and disposition of the superseded stock. If the change in the part does not need to be put into effect immediately, the engineering department usually specifies that present stocks will be exhausted before the new design goes into effect. If the superseded design for the part is adaptable to the new design by reworking, the drawing notice will so specify. In this type of change the surplus material constitutes the stock for the new part and is transferred to the new work station designated by the scheduling division. Transfer of reworkable parts or material is arranged as soon as the engineering change notice qualifications as to effective date have been met.

Often, however, parts superseded by engineering changes are not reworkable into the latest design, but still have value to the company as replacement parts for products sold while the old design was in effect, or as reworkable material for other parts. Many times a product will have several parts made of the same material with the only difference being in size. If a lot of surplus copper tubes six inches long can be used to make another part requiring two inch copper tubes, it is usually more economical to

DRAWING RELEASE CHANGE **NOTICE**

Drg. Size ..... Drg. No. .....

Name ..... Change No. .....

Model ..... Date .....

Released For .....

Details .....

.....

.....

.....

.....

.....

To Become Effective .....

Is Pattern or Die to be Changed? ..... Is Bill of Material to be Changed? .....

*Prove Design ..... — Disposition of Stock —

On Order ..... Machines on Line .....

Rough ..... Machines in Stock .....

Semi-Fin. ..... SPARES { Parts Dept. .....

Finished ..... { Warehouses .....

Assembly ..... { Dealers .....

Group ..... { Returned .....

Requested by	Approved	Approved Eng. Div.	Changed by	Checked by .....
Dept.	Dept.	.....	.....	.....
Date	Date	Date	Date	Date .....

EXHIBIT 1.

recut the surplus material than to scrap the surplus and buy new for the smaller part. The example used is a simple one, of course, but it is indicative of the savings that can be made, or the wastes that can be eliminated by having a plan for, and giving some thought to, the disposition of material no longer required in its present form.

In order to retain whatever value exists, the data concerning the surplus material are circularized to the various departments which may be able to utilize all or a part of the surplus. Speedy disposition is desirable, provided speed does not reduce the complete consideration of possible future requirements for the material in its present form and provided also that the departments keep in mind the impracticability of saving every out-dated item. Following are some of the reasons for speedy consideration of the problem:

1. To eliminate the possibility of purchasing or manufacturing items when stock is available.
2. To keep the production lines, the storerooms, and the salvage stations free of noncurrent material which is occupying space that could be utilized more efficiently.
3. To record the costs of obsolescence in the periods to which they apply, thus giving management more accurate records and reports on which future judgment may be based.
4. To put back into use, through the disposition of scrap, material not usable in its present form.

Use of Salvage Station as Clearing House

When engineering changes do not specify reworking the superseded material into the latest design, it is the responsibility of the scheduling division to advise the stock control section of the date on which the new design becomes effective and the location of the superseded stock.

Upon receipt of notice from the scheduling division, the stock control section reviews its files to determine if the superseded stock, in its present form, can be used at some other location or if the stock can be used to fill replacement parts orders from the parts department.

In those instances where the material is not believed to be usable in its present form, the stock control section requests the factory

REQUEST TO SCRAP SURPLUS MATERIAL IN THE FACTORY

No. 8245

DESCRIPTION | MODEL | PART NO.

SURPLUS DUE TO – 1. Discontinued Model ☐ 2. Noncurrent–New Parts Available ☐
3. Noncurrent–Should Have Been Used ☐ 4. Excess Purch. ☐ 5. Excess Prod. ☐

CURRENT PART—SCRAP PER CHANGE NO.

REPLACED BY | INTERCHANGEABLE YES ☐ NO ☐ | CHANGE NO. | LETTER NO.

FUTURE SOURCE OF SUPPLY
☐ WORKED MATER'L ☐ TR. R.M.
☐ PURCHASED FINISHED
APPROVED BY

FACTORY LOC. OF MATERIAL	SURPLUS QUANTITY IN FACTORY			PARTS DEPARTMENT UNIT SERVICE HISTORY									
				YEAR							AVAILABLE		
	ROUGH	SEMI-	FINISHED	19	19	19	19	19	19	TOTAL	ON HAND	ON ORD.	TOTAL

TRANS. TO PARTS DEPT.		HOLD FOR PTS. DEPT. INQUIRY
TRANSFER NO.	FIN.	

ASSEM. PART NO.	DESCRIPTION	Q. PER ASSEM	O.H.Q.	ANALYSIS OF ASSEMBLIES IN WHICH THIS PART IS USED									

☐ STANDARD PART
USED ON _____ MACHINES
☐ SPEC. ATTACH. PART
ADAPT. TO _____ MACHINES
NO. USED PER MACH. _____

Dealer's Net (Unit) $ _____ (Total) $ _____

AUTHORITY IS GIVEN TO SCRAP

ROUGH	SEMI-FINISHED	FINISHED
Invty. Control Mgr. (Parts)		
Stock Control	Stock Control	
Chief Engineer	Cost Acctg.	
Purchasing Department	General Acctg.	

ISSUED BY	DATE	SCRAPPED BY	DATE	R.E.S.M. POSTED BY	DATE

COST DATA

	M'tl	Foundry	Hours	Units	Bal. Total
Unit					
Total					

MATERIAL
UNIT WEIGHT | TOTAL WEIGHT
SCRAP VALUE | CREDIT
ENTRY OF | PRICED BY COST DEPT.

EXHIBIT 2.

material control division to locate the surplus quantities, and to have them transferred to the appropriate salvage station.

Actual movement of the material is done by the interplant transportation division upon the authority of "move" tags attached to the material by the factory material control division.

Upon receiving surplus material or parts, the inspector in charge of the salvage station prepares a list showing the description, part number, status (whether rough, semifinished, or finished), quantity, and reasons for surplus. This list is prepared in duplicate, the original going to the stock control section and the copy being retained at the salvage station.

Surplus Material Form

When lists of surplus materials and parts are received from salvage stations, stock control clerks of the stock control section again compare the items with stock records. If this recheck shows that any item reported surplus by a salvage station inspector is a current production item, the stock control section immediately notifies the inspection and scheduling divisions so that the material may be transferred to a production station.

When the stock control section determines that items listed by the salvage station inspector are noncurrent, a "Request to Scrap Surplus Material in the Factory" form (hereinafter referred to as "R.S.S.M.") (Exhibit 2) is prepared.

The stock control section is responsible for entering the following information called for by the R.S.S.M. form:

1. Description
2. Model
3. Part number
4. Factory location of material
5. Surplus quantity in the factory
6. Status
7. Future source of supply
8. Date of issuance
9. Insurer
10. Approval
11. Reasons for scrapping
    a. Noncurrent material due to discontinued model.
    b. Noncurrent or cancelled material that is to be scrapped when new parts become available.

c. Noncurrent or cancelled material that should have been used but found after new part became effective.
d. Excess material due to quantities purchased or manufactured beyond requirements.

Occasionally a newly developed part is such an improvement over the existing part that it is desired to put it into effect immediately. In these instances the engineering change specifies that all stock, including parts department stock, is to be scrapped. The R.S.S.M. covering these parts is approved by the manager of the stock control section and forwarded to the engineering department. Approval of the parts department is not required in these instances. Where the engineering change does not specify that existing replacement parts stocks are to be scrapped, the approved R.S.S.M. and a copy of the blueprint of the part are forwarded to the inventory control manager of the parts department.

In the parts department information as to service history, available quantities, and dealers' prices are entered on each R.S.S.M. After reviewing the data on this form and other available information, the inventory control manager enters on it the quantity of the surplus part he wishes transferred to parts department stock, and at the same time prepares a transfer order to the parts storeroom. After deducting the quantity which is to be transferred to the parts department, the inventory control manager signs the form in the appropriate space under the heading "Authority is Given to Scrap." If the parts department takes all the surplus the R.S.S.M. is returned to the stock control section. If some or all of the surplus remains after review by the parts department, the space for stock control section in the left column under "Authority is Given to Scrap" is crossed out by the inventory control manager and the R.S.S.M. is forwarded to the engineering department.

Because receipt of the R.S.S.M. is the only way the engineering department is advised of the quantities of surplus parts arising from engineering changes or from the discontinuance of a model, each R.S.S.M. form is routed through that department to determine whether the material shown thereon is obsolete as set out in the reasons for scrapping. Although it is impractical to find uses for all the thousands of surplus materials, where a considerable stock or a high dealers' value is involved, thought is given to adapting the material to other uses. Suggestions for such use are

entered on the back of the R.S.S.M. After completing these steps and signing the appropriate blank under "Authority is Given to Scrap," the engineering department transmits the R.S.S.M. to the purchasing department.

At Caterpillar Tractor Company the purchasing department's responsibility includes the arranging of sales of scrap and salvage material not usable by the company.[1] Each R.S.S.M. received by the purchasing department is reviewed to ascertain if surplus parts or material can be used to fill existing purchase requisitions and to determine if the material can be sold or traded for more than scrap prices. If the purchasing department arranges for disposition other than scrapping, it prepares the necessary documents to authorize movement of the material. If it agrees that the surplus material should be scrapped, the responsible individual signs the R.S.S.M. form under the heading "Authority is Given to Scrap" and returns the form to the stock control section.

Scrapping the Material

Upon receiving a R.S.S.M. which has the approval of the parts, engineering, and purchasing departments, the stock control section proceeds to dispose of the surplus quantity. A representative of the factory material control division is advised of the surplus in the salvage station and is asked to transfer the material to the reclamation division for scrapping.. When the factory material control division reports the material has been delivered to the reclamation division, the stock control section completes its entries on the applicable stock records and forwards the R.S.S.M. to the cost accounting division.

Accounting Department Responsibilities

Cost accounting division clerks post the applicable unit costs to the R.S.S.M. form and general accounting division clerks consolidate the information each month in order to charge expense and relieve inventory accounts.

Auditing division personnel is responsible for intermittently checking the various records of R.S.S.M.'s maintained by the stock control section and the general accounting division to deter-

[1] Internal check is not sacrificed because the purchasing department handles scrap sales, and the buyer is permitted to commit the company for only the quantities shown on purchase requisitions prepared by departments other than purchasing.

mine that proper handling is being given and that accounting has been made for all serial numbers. It is also the responsibility of the auditing division to determine that the internal controls provided by the procedure are properly functioning.

Conclusion

No one plan for handling surpluses can be universally applied. However, as pointed out by J. C. Bailey in his letter printed in the Cost Forum (Section II, *N.A.C.A. Bulletin,* December 15, 1946) ". . . . Idle inventories produce no revenue. . . . The disposal of slow moving, obsolete, or deteriorated materials, whether stores supplies or semifinished and finished product, calls for team play between the operating and accounting departments. . . ." As cost of labor and materials rises, business must become more proficient in obtaining the most value from its many independently small but collectively large indirect expenses. Careful attention to the disposition of surpluses, both production and nonproduction, is one way cost may be reduced.

CORRECTION

The article in the May 1, 1947 *Bulletin* by Ralph C. McKibbin, on "Valuing Flour Mill Inventories," contains two inadvertent errors, which might be confusing to anyone not familiar with the valuation of flour mill inventories. In the paragraph headed "Wheat Basis Profit or Loss," on page 1081, there appears the sentence "This average is compared with the market price of wheat and a profit or loss figure per bushel is found, a *profit* if the market exceeds the average, a *loss* if the average exceeds the market price." The last part of this statement should be reversed to read, ". . . . a *loss* if the market exceeds the average, a *profit* if the average exceeds the market price." This is illustrated by the figure on page 1083, where a profit of $2,200 on unfilled flour sales contracts is added to the inventory as a result of an average cost of $1.70, in comparison with the market price of $1.65.

In the illustration on page 1085, the final figure in the column headed "Basis Wichita" was captioned "Total wheat *in* transit, valued basis Wichita." This should have read "Total wheat *and* transit, valued basis Wichita," as the figure is a total of the values of wheat and of transit, computed as separate inventory elements.